

AMENDMENTS TO THE CLAIMS:

Please add new claims 63-110 set forth below. These claims are the same as claims 11-47, 51-54 and 56-62 that were canceled in the Amendment filed April 19, 2011. For the convenience of the Examiner, all pending claims are listed hereinafter.

LISTING OF CLAIMS:

1. A semiconductor element module, comprising:
 - a package having a base and opposing side surfaces;
 - a semiconductor element arranged within said package; and
 - a plurality of leads extending along said side surfaces of the package with an open end of each of said leads extending at least to a package attaching plane, wherein each of said leads is soldered to said substrate and electrically connected through said package to said semiconductor element and serving to connect said semiconductor element to an external circuit;
 - wherein said base is shaped to form an extended portion providing a level difference along the base portion between said package and the plurality of leads proximate said package attaching plane so that a space is formed between the leads and the package; and
 - wherein said level difference serves to avoid capillary flow of solder to prevent short-circuiting between the leads adjacent to each other.

2. A semiconductor device, comprising:

a semiconductor element module according to claim 1; and

a substrate having conductor patterns and through-holes for connecting the conductor patterns to each other, wherein each of said leads is soldered to the substrate through an operative one of said through-holes so that the bottom of said package abuts on a mounting plane of the substrate.

3. A semiconductor device, comprising a semiconductor element module including:

a substrate;

a package having a base and opposing side surfaces:

a semiconductor element arranged within said package; and

a plurality of leads extending along said side surfaces of the package with an open end of each of said leads extending at least to a package attaching plane, wherein each of said leads is soldered to said substrate and electrically connected through said package to said semiconductor element and serving to connect said semiconductor element to an external circuit;

wherein said base is shaped to form an extended portion providing a level difference along the base portion between said package and the plurality of leads proximate said package attaching plane so that a space is formed between the leads and the package; and

a substance having conductor patterns for lead connection on a mounting plane thereof wherein each of said leads is soldered to the substrate through holes in each of said conductor patterns so that the bottom of said package forms a prescribed space from the mounting plane to avoid capillary flow of solder.

4. A semiconductor element module, comprising:

a substrate;

a package having a base and opposing side surfaces;

a semiconductor element arranged within said package;

a plurality of leads extending along said side surfaces of the package with an open end of each of said leads extending at least to a package attaching plane, wherein each of said leads is soldered to said substrate and electrically connected through said package to said semiconductor element and serving to connect said semiconductor element to an external circuit; and

brazing material for connecting said package and each of said leads;

wherein said base is shaped to form an extended portion providing a level difference along the base portion between said package and the plurality of leads proximate said package attaching plane so that a space is formed between the leads and the package; and

wherein said level difference permits each of said leads to be shaped proximate said package to avoid capillary flow of solder and prevent short-circuiting between the leads adjacent to each other.

5. A semiconductor element module, comprising:

a substrate;

a package having a base and opposing side surfaces;

a semiconductor element arranged within said package; and

a plurality of leads extending along said side surfaces of the package with an open terminal of each of said leads extending at least to a package attaching plane,

wherein each of said leads is soldered to said substrate and electrically connected through said package to said semiconductor element and serving to connect said semiconductor element to an external circuit;

wherein a shape of said leads provides a level difference along the base portion between said package and the plurality of leads proximate said package attaching plane, said shape being such that a space is formed between the leads and the package; and

wherein said level difference serves to avoid capillary flow of solder to prevent short-circuiting between the leads adjacent to each other.

6. A semiconductor device comprising a semiconductor element module according to claim 5 and a substrate having conductor patterns and through-holes for connecting the conductor patterns to each other wherein each of said leads is soldered to the substrate through each said through-holes so that said level difference of each of said leads abuts on a mounting plane of the substrate.

7. A semiconductor device comprising a semiconductor element module including:

a substrate;

a package having a base and opposing side surfaces;

a semiconductor element arranged within said package; and

a plurality of leads extending along said side surfaces of the package with an open terminal of each of said leads extending at least to a package attaching plane, wherein each of said lead, is soldered to said substrate and electrically connected

through said package to said semiconductor element and serving to connect said semiconductor element to an external circuit;

wherein a shape of said leads provides a level difference along the base portion between said package and the plurality of leads proximate said package attaching plane, said shape being such that a space is formed between the leads and the package; and

a substrate having conductor patterns for lead connection on a mounting plane thereof wherein each of said leads is soldered to the substrate through holes in each of said conductor patterns so that the bottom of said package forms a prescribed space from the mounting plane; and

wherein said level difference serves to avoid capillary flow of solder to prevent short-circuiting between the leads adjacent to each other.

8. A semiconductor element module comprising:

a substrate;

a package having a base and opposing side surfaces;

a semiconductor element arranged within said package;

a plurality of leads extending along said side surfaces of the package with an open terminal of each of said leads extending at least to a package attaching plane, wherein each of said leads is soldered to said substrate and electrically connected through said package to said semiconductor element and serving to connect said semiconductor element to an external circuit;

brazing material for connecting said package and each of said leads;

wherein a shape of said leads provides a level difference along the base portion between said package and the plurality of leads proximate said package attaching plane, said shape being such that a space is formed between the leads and the package; and

wherein said level difference provides different mechanical strengths permitting each of said leads to be bent proximate said package to avoid capillary flow of solder and prevent short-circuiting between the leads adjacent to each other.

9. A semiconductor element module according to claim 1, wherein said semiconductor element is an optical element.

10. A semiconductor element module according to claim 5, wherein said semiconductor element is an optical element.

63. A semiconductor element module, comprising:
a package;
a semiconductor element within said package;
a plurality of leads for connecting said semiconductor element to an external circuit,
said plurality of leads each having one end portion attached along a side surface of
said package and another open end portion bent in an outward direction relative to
the side surface of said package, said open end portion being downwardly protruded
from a plane including a bottom surface of said package; and

a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package.

64. A semiconductor element module according to claim 63, further comprising a brazing material disposed within said level difference to secure the attachment of said leads to said package.

65. A semiconductor element module according to claim 64, wherein said brazing material is disposed at a location remote from the bottom surface of said package.]

66. A semiconductor element module according to claim 63 wherein said leads extend along and are attached to a side surface of said package.

67. A semiconductor element module according to claim 63, wherein said semiconductor element is an optical element.

68. A semiconductor device comprising a substrate and a semiconductor element module mounted on said substrate, said semiconductor element module including:

a package;

a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion bent in an outward direction relative to the side surface of said package, said open end portion being downwardly protruded from a plane including a bottom surface of said package; and
a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package.

69. A semiconductor device according to claim 68, wherein said substrate has a mounting surface and conductor patterns formed on said mounting surface, said semiconductor element module being mounted on said substrate by joining said open end portions of said leads to said conductor patterns.

70. A semiconductor device according to claim 68, further comprising a brazing material disposed within said level difference to secure the connection of said leads to said package.

71. A semiconductor device according to claim 68, wherein said semiconductor element is an optical element.

72. A semiconductor device according to claim 68, wherein said substrate has a mounting surface, said semiconductor element module being mounted on said

substrate so that the bottom surface of said package is spaced from said mounting surface of said substrate by a prescribed distance.

73. A semiconductor element module, comprising:

a package having an opening for allowing an optical signal to pass therethrough;

an optical element located in said package for outputting or inputting the optical signal;

a plurality of leads for connecting said optical element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion bent in an outward direction relative to the side surface of said package, said open end portion being downwardly protruded from a plane including a bottom surface of said package; and

a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package,

each of said leads having an uppermost end which is lower than an uppermost end of said opening.

74. A semiconductor element module, comprising:

a package having an inner bottom surface and an opening for allowing an optical signal to pass therethrough;

an optical element located in said package for outputting or inputting the optical signal;

a plurality of leads for connecting said optical element to an external circuit,
said plurality of leads each having one end portion attached along a side surface of
said package and another open end portion bent in an outward direction relative to
the side surface of said package, said open end portion being downwardly protruded
from a plane including a bottom surface of said package; and

a level difference at the side surface of said package adjacent to the bottom
surface of said package so as to form a space between said leads and said
package,

each of said leads having an uppermost end which is lower than an
uppermost end of said opening, said level difference having a surface which
intersects the side surface of said package, and the surface of said level difference
being higher than the inner bottom surface of said package.

75. A semiconductor element module according to claim 74, further
comprising a brazing material disposed within said level difference to secure the
attachment of said leads to said package.

76. A semiconductor device comprising a substrate and a semiconductor
element module mounted on said substrate,
said semiconductor element module including;
a package having an inner bottom surface and an opening for allowing an
optical signal to pass therethrough;
an optical element located in said package for outputting or inputting the
optical signal;

a plurality of leads for connecting said optical element to an external circuit,
said plurality of leads each having one end portion attached along a side surface of
said package and another open end portion bent in an outward direction relative to
the side surface of said package, said open end portion being downwardly protruded
from a plane including a bottom surface of said package; and

a level difference at the side surface of said package adjacent to the bottom
surface of said package so as to form a space between said leads and said
package,

each of said leads having an uppermost end which is lower than an
uppermost end of said opening, said level difference having a surface which
intersects the side surface of said package, and the surface of said level difference
being higher than the inner bottom surface of said package.

77. A semiconductor element module, comprising;
a package having an opening for allowing an optical signal to pass
therethrough;
an optical element located in said package for outputting or inputting the
optical signal;
a mount having said optical element placed thereon for fixing said optical
element to said package;
a plurality of leads for connecting said optical element to an external circuit,
said plurality of leads each having one end portion attached along a side surface of
said package and another open end portion bent in an outward direction relative to

the side surface of said package, said open end portion being downwardly protruded from a plane including a bottom surface of said package; and
a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package.

each of said leads having an uppermost end which is lower than an uppermost end of said opening, said level difference having a surface which intersects the side surface of said package, and the surface of said level difference being higher than a bottom surface of said mount.

78. A semiconductor element module according to claim 77, further comprising a brazing material disposed within said level difference to secure the attachment of said leads to said package.

79. A semiconductor device comprising a substrate and a semiconductor element module mounted on said substrate,
said semiconductor element module including;
a package having an opening for allowing an optical signal to pass therethrough;
an optical element located in said package for outputting or inputting the optical signal;
a mount having said optical element placed thereon for fixing said optical element to said package;

a plurality of leads for connecting said optical element to an external circuit,
said plurality of leads each having one end portion attached along a side surface of
said package and another open end portion bent in an outward direction relative to
the side surface of said package, said open end portion being downwardly protruded
from a plane including a bottom surface of said package; and

a level difference at the side surface of said package adjacent to the bottom
surface of said package so as to form a space between said leads and said
package,

each of said leads having an uppermost end which is lower than an
uppermost end of said opening, said level difference having a surface which
intersects the side surface of said package, and the surface of said level difference
being higher than a bottom surface of said mount.

80. A semiconductor element module, comprising:

a package;

a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external
circuit, said plurality of leads each having one end portion attached along a side
surface of said package and another open end portion having a tip which is
downwardly protruded from a plane including a bottom surface of said package and
which is oriented in an outward direction relative to said side surface of said
package; and

a level difference at said side surface of the package adjacent to said bottom
surface of the package so as to form a space between said leads and said package.

81. A semiconductor element module according to claim 80, further comprising a brazing material disposed within said level difference to secure the attachment of said leads to said package.

82. A semiconductor element module according to claim 80, wherein said level difference has a surface which intersects the side surface of said package and which is substantially perpendicular to said side surface and a portion of the leads which protrude downwardly therefrom, and further including a brazing material which is disposed between the surface of said level difference and the downwardly protruding portion of the leads to secure the attachment of said leads to said package.

83. A semiconductor element module according to claim 80, wherein each of said leads has an uppermost end, and a distance between the bottom surface of said package and the uppermost end of each of said leads is larger than the distance between the tip of the open end of each of said leads and the bottom surface of said package.

84. A semiconductor element module according to claim 80, wherein said level difference has a surface which intersects the side surface of said package, and a distance between the bottom surface of said package and the surface of said level difference is larger than the distance between the tip of the open end of each of said leads and the bottom surface of said package.

85. A semiconductor element module, comprising:

a package;

a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion being downwardly protruded from a plane including a bottom surface of said package;

a level difference formed by a surface which intersects the side surface of said package adjacent to the bottom surface of said package and which is substantially perpendicular to said side surface and a portion of the leads which protrude downwardly therefrom so as to form a space between said leads and said package; and

a brazing material disposed between the surface of said level difference and the downwardly protruding portion of the leads to secure the attachment of said leads to said package.

86. A semiconductor element module according to claim 85, wherein said brazing material is disposed at a location remote from the bottom surface of said package.

87. A semiconductor element module, comprising:

a package having an opening for allowing an optical signal to pass therethrough;

an optical element located in said package for outputting or inputting the optical signal;

a plurality of leads for connecting said optical element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion being downwardly protruded from a plane including a bottom surface of said package; and

a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package,

each of said leads having an uppermost end which is lower than an uppermost end of said opening.

88. A semiconductor element module, comprising: a semiconductor element; a package having walls that surround said semiconductor element; a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion attached along the exterior surface of a side wall of said package and another open end portion being downwardly protruded from a plane including a bottom surface of said package;

a level difference that forms a recess away from the exterior surface of the side wall of said package adjacent to the bottom surface of said package, said recess having a width which is greater than the thickness of said side wall; and a brazing material disposed within said recess to secure the attachment of said leads to said package.

89. A semiconductor element module according to claim 88, wherein said brazing material is disposed at a location remote from the bottom surface of said package.

90. A semiconductor element module, comprising:
a package having an inner bottom surface and an opening for allowing an optical signal to pass therethrough;
an optical element located in said package and supported by said inner bottom surface, for outputting or inputting the optical signal;
a plurality of leads for connecting said optical element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open portion being downwardly protruded from a plane including a bottom surface of said package; and
a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package
and wherein each of said leads has an uppermost end which is lower than an uppermost end of said opening, said level difference having a surface which intersects the side surface of said package, and the surface of said level difference being higher than the inner bottom surface of said package.

91. A semiconductor element module according to claim 90, further comprising a brazing material disposed within said level difference to secure the attachment of said leads to said package.

92. A semiconductor element module, comprising:
a package having an opening for allowing an optical signal to pass therethrough;
an optical element located in said package for outputting or inputting the optical signal;
a mount having said optical element placed thereon for fixing said optical element to said package;
a plurality of leads for connecting said optical element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion being downwardly protruded from a plane including a bottom surface of said package; and
a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package,
and wherein each of said leads has an uppermost end which is lower than an uppermost end of said opening, said level difference having a surface which intersects the side surface of said package, and the surface of said level difference being higher than a bottom surface of said mount.

93. A semiconductor element module according to claim 92, further comprising a brazing material disposed within said level difference to secure the attachment of said leads to said package.

94. A semiconductor element module, comprising:
a package;
a semiconductor element within said package;
a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion for attachment to a mounting surface, said open end portion being downwardly protruded from a plane including a bottom surface of said package and being shaped to provide a space between the bottom surface of said package and the mounting surface;
a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package; and
a brazing material disposed within said level difference to secure the connection of said leads to said package, to thereby enable said space between the bottom surface of said package and the mounting surface to be no greater than a prescribed amount.

95. A semiconductor element module according to claim 94, wherein said shape comprises an outward bending of the open end portion of the leads to define a

mounting plane that is substantially parallel to said bottom surface at said prescribed distance therefrom.

96. A semiconductor element module according to claim 94, wherein said shape comprises a transition in the width of said leads that defines an abutment at said prescribed distance below the bottom surface of said package.

97. A semiconductor device comprising a substrate and a semiconductor element module mounted on said substrate, said semiconductor element module including:

a package;

a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion for attachment to a mounting surface, said open end portion being downwardly protruded from a plane including a bottom surface of said package and being shaped to provide a space between the bottom surface of said package and the mounting surface;

a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package; and

a brazing material disposed within said level difference to secure the connection of said leads to said package, to thereby enable said space between the

bottom surface of said package and the mounting surface to be no greater than a prescribed amount.

98. A semiconductor element module according to claim 97, wherein said shape comprises an outward bending of the open end portion of the leads to define a mounting plane that is substantially parallel to said bottom surface at said prescribed distance therefrom.

99. A semiconductor element module according to claim 97, wherein said shape comprises a transition in the width of said leads that defines an abutment at said prescribed distance below the bottom surface of said package.

100. A semiconductor device comprising a substrate and a semiconductor element module mounted on said substrate,
said substrate having a plurality of through-holes and conductor patterns;
said semiconductor element module, including:
a package;
a semiconductor element within said package;
a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion attached to a side surface of said package and another open end portion being downwardly protruded from a plane including a bottom surface of said package, at least one of said plurality of leads being connected to a high frequency terminal of said semiconductor element module; and

a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package;

wherein each lead connected to a high frequency terminal is surface-mounted onto said conductor pattern, while each of the remaining leads is inserted into said each of said through-holes.

101. A semiconductor element module, comprising:

a package;

a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion of a first width attached along a side surface of said package, an open end portion of a second, narrower width being downwardly protruded from a plane including a bottom surface of said package, and a level difference which defines a transition from said first width to said second width; and

a brazing material located at an edge of said package to secure the attachment of said leads to said package;

wherein said level difference is located lower than said brazing material.

102. A semiconductor element module according to claim 101, wherein each of said leads is bent at a point below said level difference.

103. A semiconductor device, comprising;
a substrate having a mounting surface on which conductor patterns are
formed; and
a semiconductor element module having:
a package;
a semiconductor element within said package;
a plurality of leads for connecting said semiconductor element to an
external circuit, said plurality of leads each having one end portion of a first width
attached along a side surface of said package, an open end portion of a second,
narrower width being downwardly protruded from a plane including a bottom surface
of said package, and a level difference which defines a transition from said first width
to said second width, wherein each of said leads is bent at a point below said level
difference; and
a brazing material located at an edge of said package to secure the
attachment of said leads to said package, wherein said level difference is located
lower than said brazing material;
wherein said open end portions of said leads on said semiconductor element
module are soldered onto said conductor patterns so that a bottom of said package
forms a prescribed space with said mounting surface.

104. A semiconductor element module, comprising:
a package;
a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having a wide portion connected to a side surface of said package and a narrow portion that extends downwardly beyond the bottom surface of said package, wherein said wide portion extends below the bottom edge of said side surface, and

a level difference in said side surface of said package adjacent said bottom surface that forms a space between the wide portion of each lead that extends below the bottom edge of said side surface and the bottom of said package.

105. The semiconductor package of claim 104, further including a brazing material disposed within said level difference for securing the connection of said leads to said package.

106. The semiconductor package of claim 104, wherein said narrow portions of said leads are bent outwardly away from said package to form a mounting surface.

107. A semiconductor element module, comprising:
a package;
a semiconductor element within said package;
a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion having a tip which is downwardly protruded from a plane including a bottom surface of said package and

which is oriented in an outward direction relative to said side surface of said package;

a level difference at said side surface of said package adjacent to said bottom surface of said package so as to form a space between said leads and said package;

wherein said level difference has a first surface which intersects the side surface of said package and which is substantially perpendicular to said side surface and a portion of the leads which protrude downwardly therefrom, and a second surface which intersects said first surface and which is substantially parallel to said side surface;

wherein said semiconductor element module further includes a brazing material that is disposed between said first surface and each of the downwardly protruding portions of the leads to secure the attachment of said leads to said package; and

wherein said brazing material forms a brazed joint fillet that is displaced from said second surface.

108. A semiconductor device comprising a substrate and a semiconductor element module mounted on said substrate, said semiconductor element module including:

a package;

a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion attached along a side

surface of said package and another open end portion having a tip which is downwardly protruded from a plane including a bottom surface of said package and which is oriented in an outward direction relative to said side surface of said package;

a level difference at said side surface of said package adjacent to said bottom surface of said package so as to form a space between said leads and said package;

wherein said level difference has a first surface which intersects the side surface of said package and which is substantially perpendicular to said side surface and a portion of the leads which protrude downwardly therefrom, and a second surface which intersects said first surface and which is substantially parallel to said side surface;

wherein said semiconductor element module further includes a brazing material that is disposed between said first surface and each of the downwardly protruding portions of the leads to secure the attachment of said leads to said package; and

wherein said brazing material forms a brazed joint fillet that is displaced from said second surface.

109. A semiconductor element module, comprising;
a package having an opening for allowing an optical signal to pass therethrough;
an optical element located in said package for outputting or inputting the optical signal;

a mount disposed between said optical element and said package;
a plurality of leads for connecting said optical element to an external circuit,
said plurality of leads each having one end portion attached along a side surface of
said package and another open end portion bent in an outward direction relative to
the side surface of said package, said open end portion being downwardly protruded
from a plane including a bottom surface of said package; and
a level difference at the side surface of said package adjacent to the bottom
surface of said package so as to form a space between said leads and said
package,
each of said leads having an uppermost end which is lower than an
uppermost end of said opening, said level difference having a surface which
intersects the side surface of said package, and the surface of said level difference
being higher than a bottom surface of said mount.

110. A semiconductor element module according to claim 109, further
comprising a brazing material disposed within said level difference to secure the
attachment of said leads to said package.